Regional Screenline Traffic Count Program

Prepared For:

Southern California Association of Governments

Los Angeles County Metropolitan Transportation Authority

Prepared By:

Meyer, Mohaddes Associates, Inc.
400 Oceangate, Suite 480
Long Beach, CA 90802-4307

In Association with

VRPA Technologies
WILTEC

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1. INTRODUCTION

Agencies traditionally have placed a great deal of emphasis on the development and implementation of tools and methodologies for forecasting transportation demand and future highway performance through the use of travel demand models. However, the development of tools and databases to validate these models, based on actual existing transportation conditions (counts), has usually lagged behind.

The count databases that are available are typically old, include many estimates rather than recent hard data, and are often uncoordinated with local agencies. Also, there has not been a great deal of priority given to traffic counting efforts, perhaps because this is one of the easiest items to defer in terms of budget allocation and dedication of staff. Recognizing these long-standing issues, SCAG jointly with MTA initiated the Regional Screenline Traffic Count project to develop a comprehensive, defensible model validation screenline traffic count database for the Southern California region.

The main objectives for this project were identified as follows:

- development of a regional screenline traffic count database system;
- collection of existing available traffic counts from cities and agencies;
- development of a framework for categorizing the screenline locations into similar groups; and
- estimation of the 2003 Annual Average Weekday Traffic (AAWT) counts.

For the first task, a GIS-based Regional Traffic Count Database System was developed using ArcView and Microsoft Access programs. The Database system has user-friendly interfaces for updating and querying the database. The system is capable of storing information including, but not limited to the following:

- obtained and collected hourly traffic counts,
- vehicle classification information,
- auto occupancy data,
- geographic information,
- date of the count, and
- source of the data.

As part of this program, Caltrans, LADOT and other local jurisdictions were contacted to obtain the most recent traffic counts at the regional model screenline locations. The collected information was reviewed for reliability and consistency and then was added into the new GIS based Regional Traffic Count Database System.

A Three-Tier functional class framework was created for developing temporal variation factors to convert traffic counts to Annual Weekday Average Traffic

(AAWT) volume data. The framework defines a set of roads as a "group" and all roads within that group are assumed to behave similarly with respect to temporal variations. The three Tiers are as follows:

- Tier 1: Freeways and State Highways
- Tier 2: Principal and Minor Arterials
- Tier 3: Major collectors

The existing available traffic counts were reviewed and screenline locations where data were not available were identified. A plan was developed to collect new vehicle counts as well as vehicle classification counts at these locations. Then, traffic counts were converted to 2003 AAWT volumes by applying a set of adjustment factors that are developed as part of this project. The truck percentages at the screenline locations are also estimated based on the analysis of classification counts.

Lastly, SCAG and MTA will require updated traffic counts for future model validations that are performed on a three-year cycle. It is the agencies' desire to maximize their resources and efficiencies for this effort. Hence, a cost effective plan was recommended to keep the regional traffic count program up-to-date and develop a high-quality practical resource framework for all involved parties. The plan recommends a set of action items to be followed as detailed in this report.

2. REGIONAL SCREENLINE TRAFFIC COUNT DATABASE SYSTEM

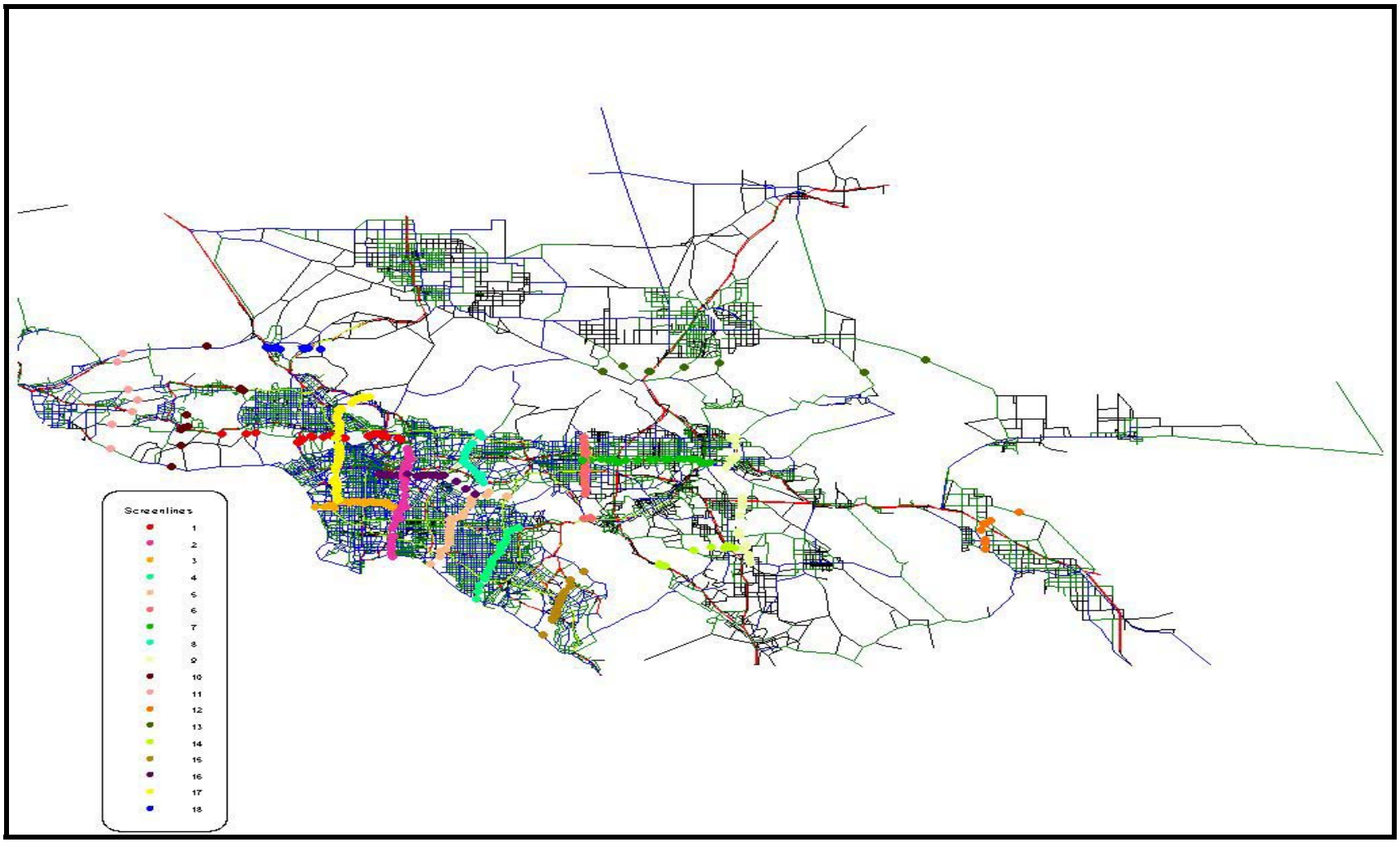
The Regional Screenline Traffic Count Database System is designed to be a user friendly environment for storing detailed traffic count data and related information as well as a user-friendly system for viewing and importing the traffic count data for use and analysis in other applications. The system has two major components: a GIS point layer and a Microsoft Access Database. The GIS system allows the user to view the geographic locations of the screenlines and count locations and the associated database system stores the traffic count information, which is referenced to the GIS layer. A common screenline identification number links the two components.

2.1 GIS Point Layer

The GIS point coverage is designed to locate and view the screenline locations independent of the SCAG regional highway model networks. The point layer can be superimposed over any regional model network and contains a point for each screenline location by direction as shown in Figure 1.

A screenline count point is generated at the coordinates of the mid-point of the 2000 highway network link associated with a specific screenline location. It should be noted that the 2000 highway network was projected to the Universal Transverse Mercator (UTM) Zone 11 grid system to be compatible with SCAG GIS system requirements.

Figure 1. Screenline GIS Coverage



2.2 Traffic Count Database

The traffic count database, using the Microsoft Access program, was developed for inputting, viewing and reporting the traffic count data at regional screenline locations. The database was designed for maximum flexibility and ease of use for storing a wide range of traffic data. The database table structures and user interfaces are discussed below.

2.2.1 Tables Structure

The traffic count database system is composed of following five major tables:

1. Screenline Point Data
2. Auto Count Data
3. Truck Count Data
4. Auto Occupancy Data
5. Axle to Truck Type Conversion Factors

Each table stores different information items which are referenced and related to each other through the common numerical screenline point "id". The table structures are as follows:

- Screenline Point Data:
  - Screenline point "id"
  - SCAG model network A-node
  - SCAG model network B-node
  - Facility name
  - Direction
  - Cross streets
  - Number of lanes
  - Assignment group

- Auto / Truck count data
  - Screenline point "id"
  - 24:00-1:00 Auto / Truck Count data
  - 1:00-2:00 Auto / Truck Count data
  - 2:00-3:00 Auto / Truck Count data
  - 3:00-4:00 Auto / Truck Count data
  - ……
  - ……
  - 22:00-23:00 Auto / Truck Count data
  - 23:00-24:00 auto / Truck Count data
  - Average Daily Traffic as an input
  - Daily Traffic Volume calculated as sum of the 24 hour traffic count data

- Collection Type: ADT only, 24 hours and Partial Data
- Source of data
- Collection date
- Notes – Any comments by the data entry person

- Auto Occupancy Table
  - Screenline point Id
  - Start Time
  - End Time
  - Freeway auto count
  - HOV Auto count
  - Source of data
  - Collection date
  - Notes – Any comments by the data entry person

The database also has a reference table showing the percentage distribution of light, medium, and heavy trucks for each axle type as shown in Table 1. These percentages were developed as part of the SCAG Regional Goods Movement Count Study and are used to convert the observed number of trucks by each axle type into the corresponding weight categories of light-heavy, medium-heavy and heavy-heavy trucks.

Table 1. Axle to Truck Type Conversion Factors

Type	2-Axle	3-Axle	4-Axle	5-Axle
Light	0.23	0.10	0.00	0.00
Medium	0.56	0.12	0.03	0.00
Heavy	0.21	0.87	0.97	1.00
Total	1.00	1.00	1.00	1.00

2.2.2 Input, View and Reports

The traffic count database system is designed for maximum flexibility and ease of use for inputting the data, viewing the data and generating user reports. Once the database is opened, the main menu allows the user to select either "Input/View Data" or "Reports" as shown in Figure 2.

If the user selects the "View/Add Data" option, the "View/Add" Data window will open as shown in Figure 3. The user will select a screenline, choose a location and select the data type. Finally, the user chooses either the "Input Data or the View Data" option.

If “Input Data” is selected, “Enter Data” window for auto, truck or auto occupancy will be displayed as shown in Figures 4, 5 and 6, respectively. The user then enters the traffic count data and upon completion, clicks the Submit button.

If the user selects “View Data” as shown in Figure 3, the “View Data” window is displayed as shown in Figures 7, 8 and 9. The user will follow the instructions provided on each screen to view the data. It should be noted that for viewing the truck data, the user can specify whether he/she wants to see the truck counts in terms of truck axle types or by the three weight categories.

Another function of the database system is to query the tables and generate reports. If the “Reports” option is selected in the Main page, as shown in Figure 2, the “Reports” window will open as illustrated in Figure 10. The user can select auto, truck or auto occupancy reports, which provide listings of available data in the database system. A sample of such a report is shown in Figure 11. It should be noted that each report could be saved as either an MS Excel or MS Word file.

Figure 2. Main Menu Window

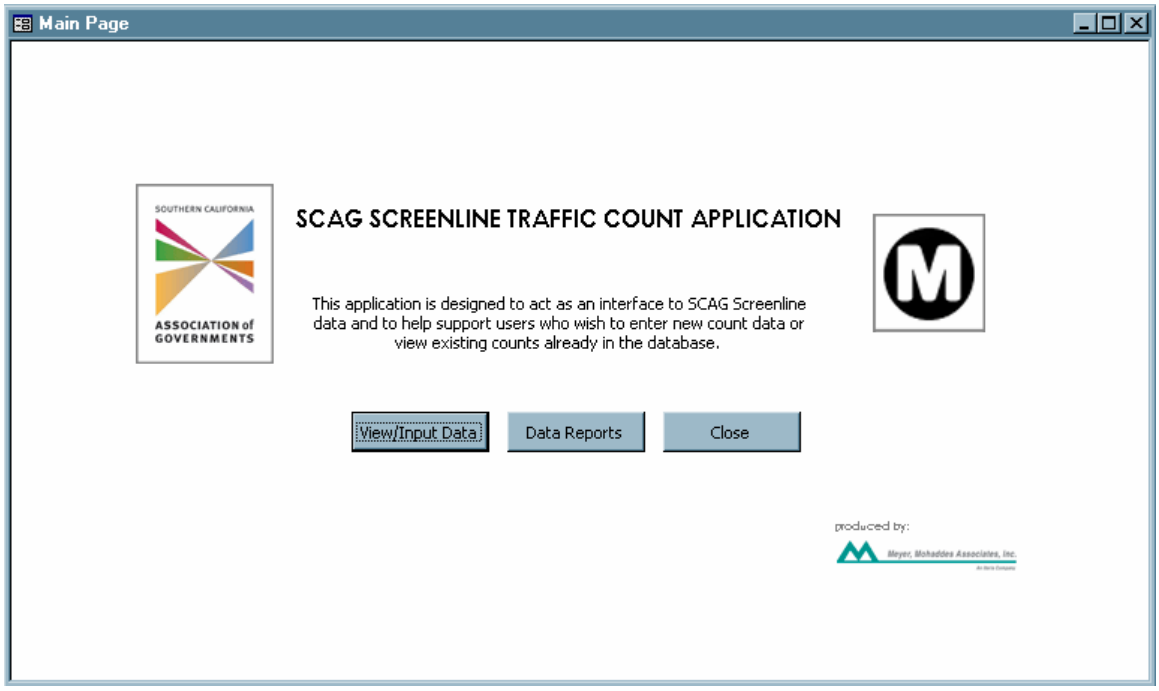


Figure 3. View/Add Count Data Window

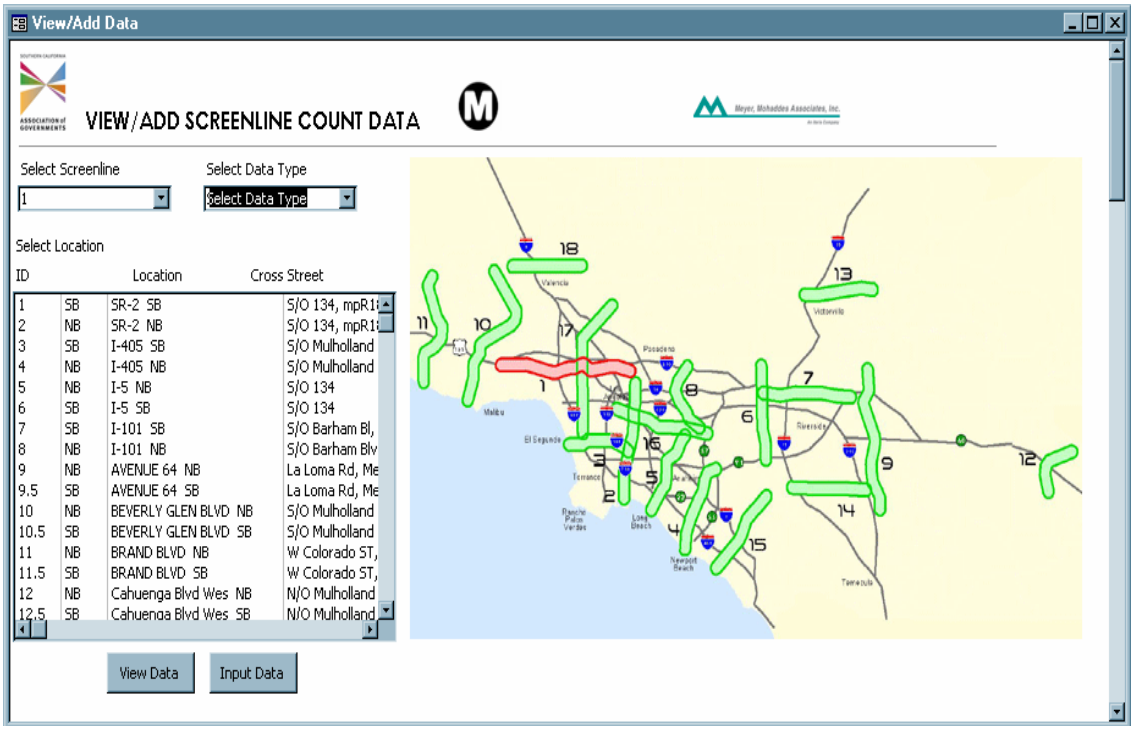


Figure 4. Enter Auto Data Window

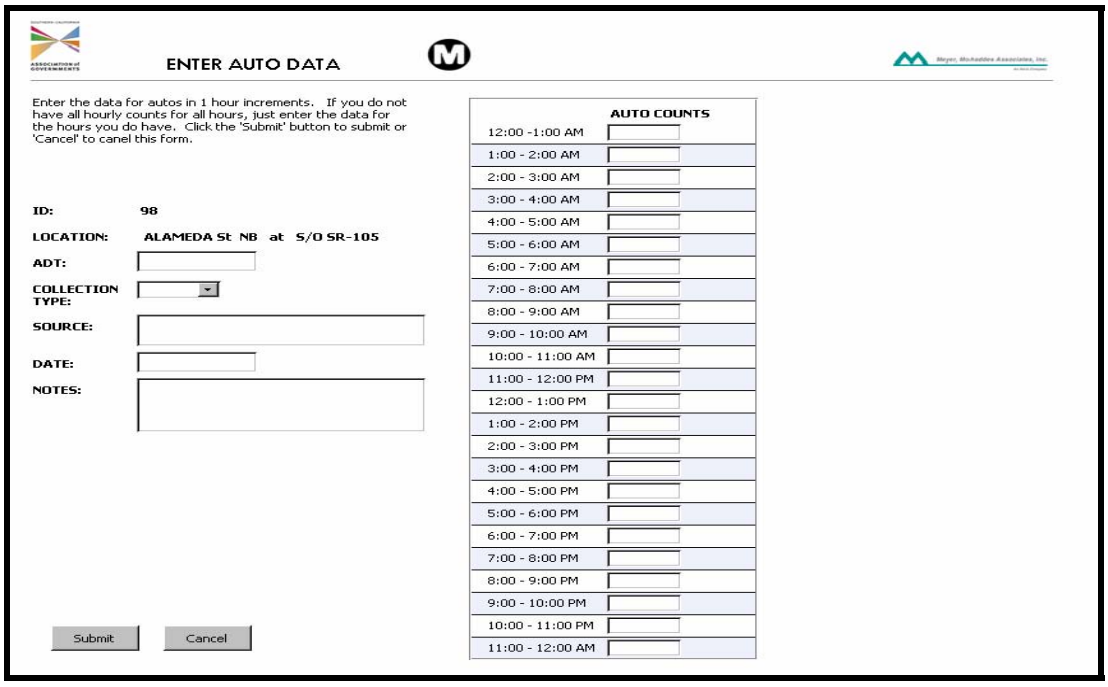


Figure 5. Enter Truck Data Window

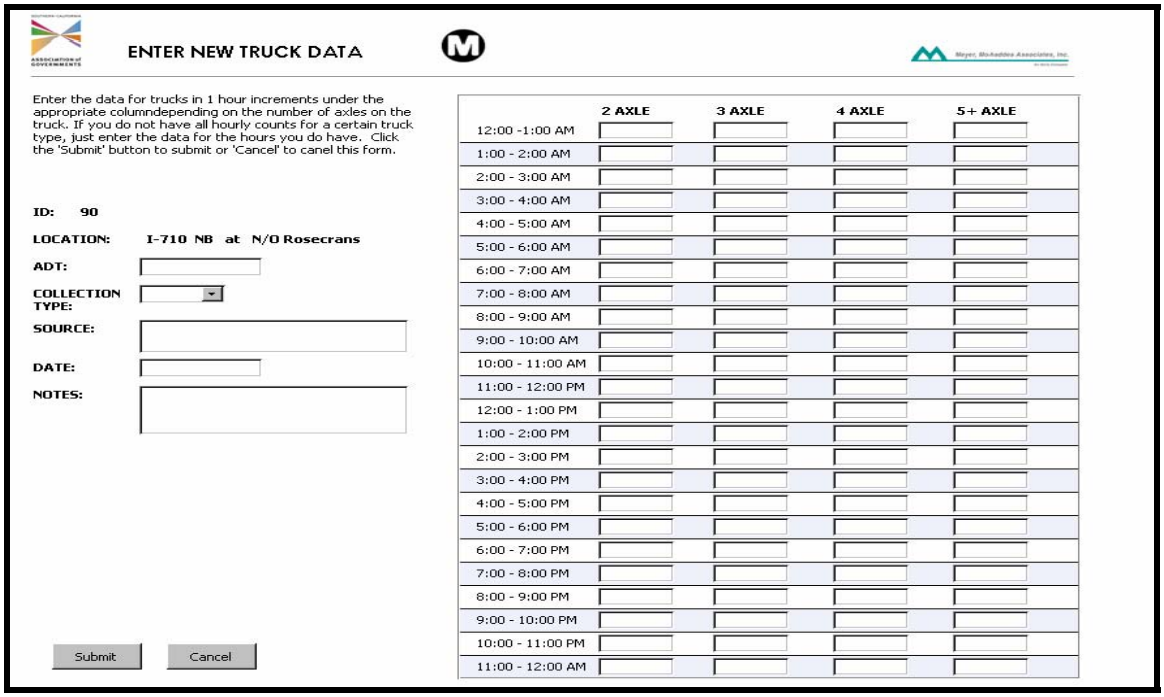


Figure 6. Enter Auto Occupancy Window

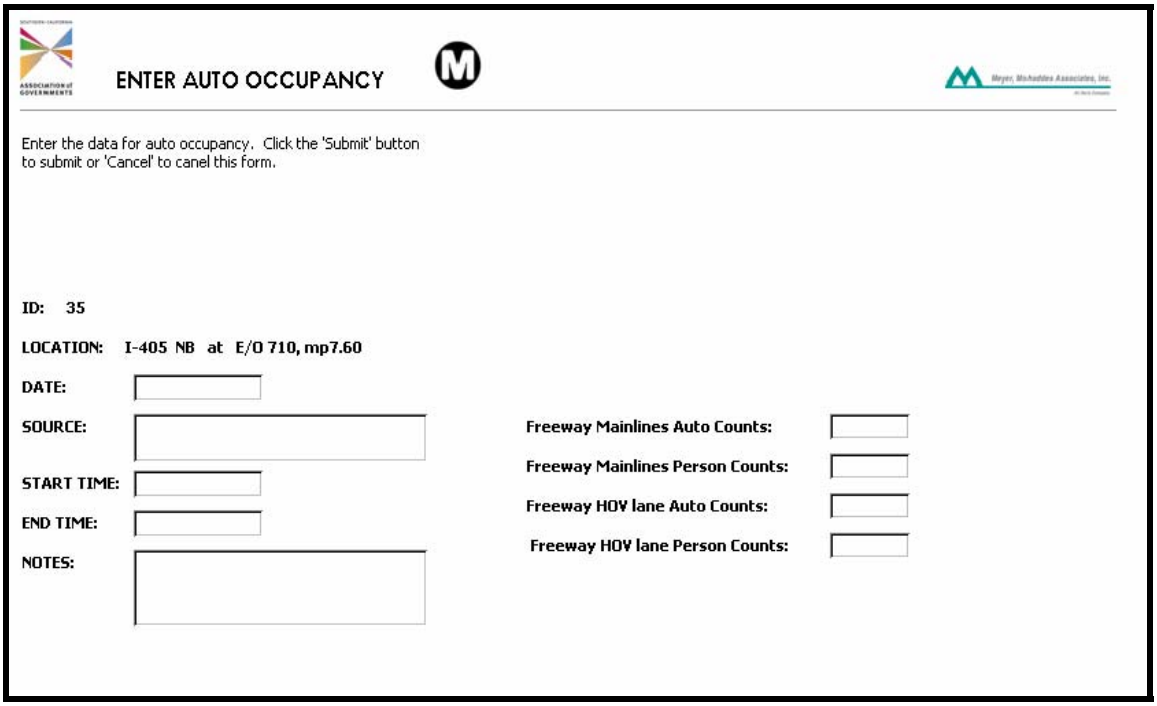


Figure 7. View Auto Data Window

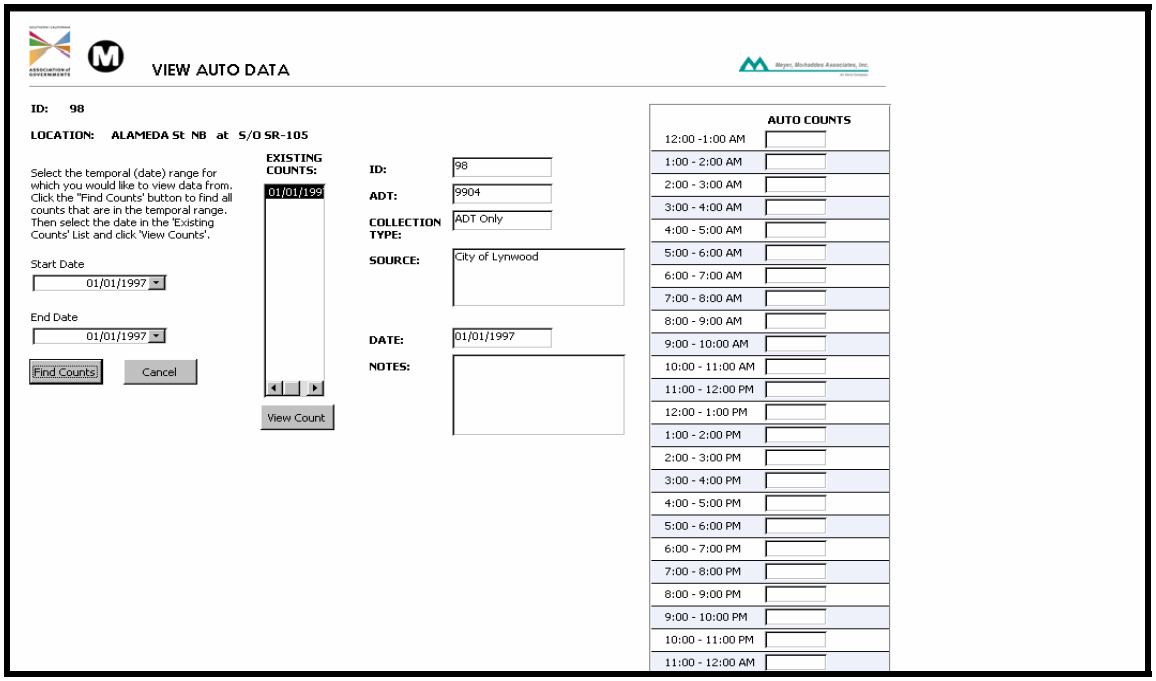


Figure 8. View Truck Data Window

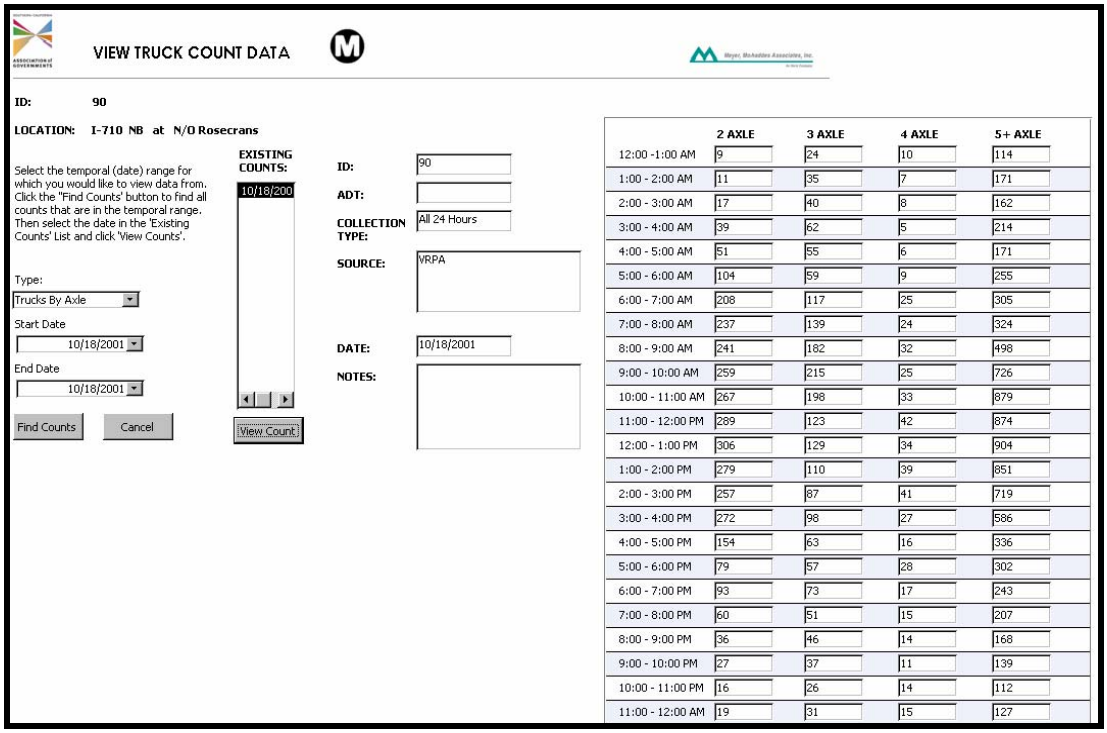


Figure 9. View Auto Occupancy Window

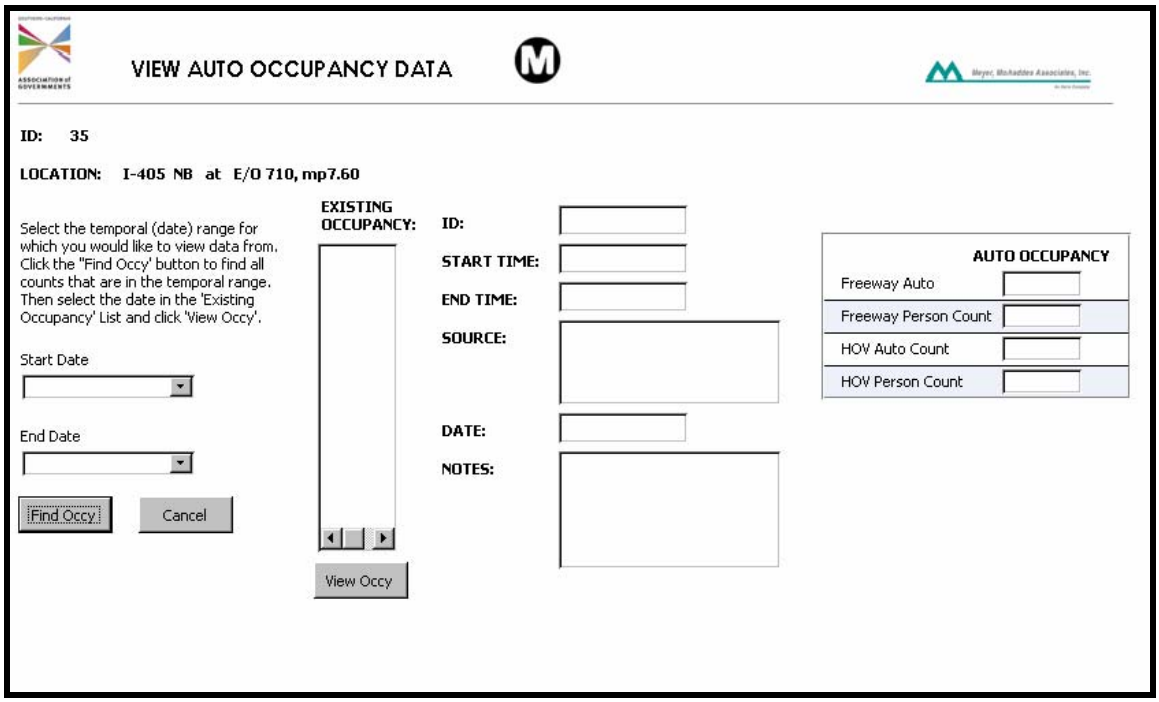


Figure 10. Reports Window

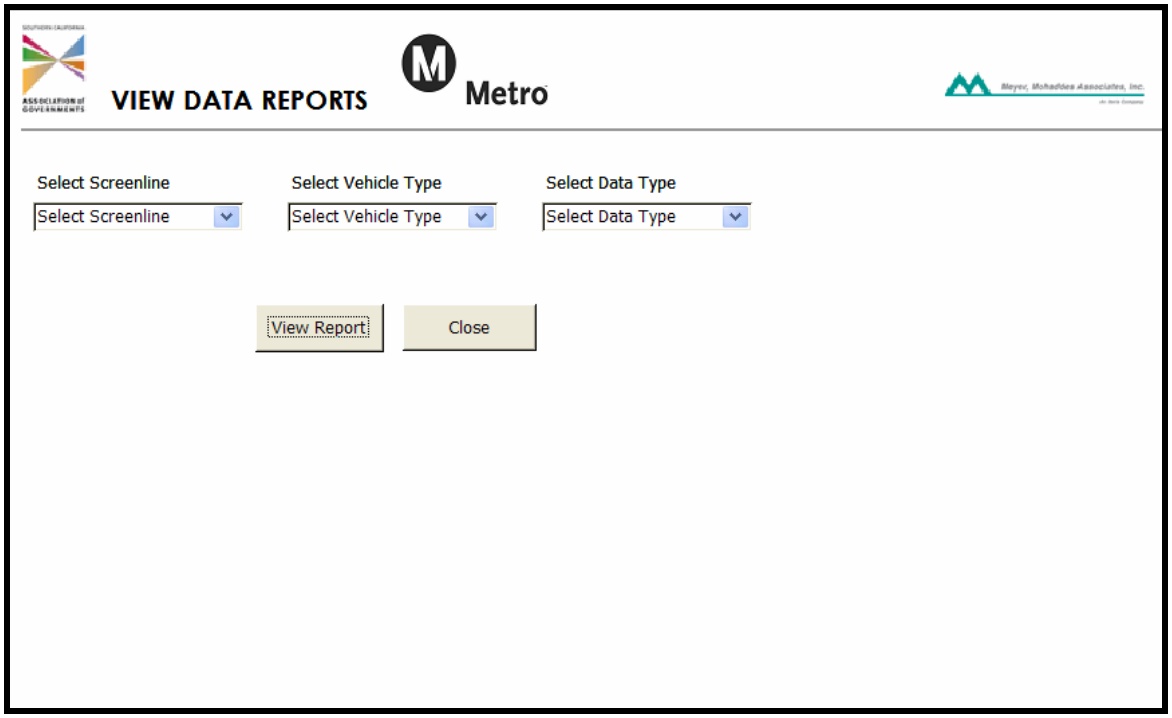
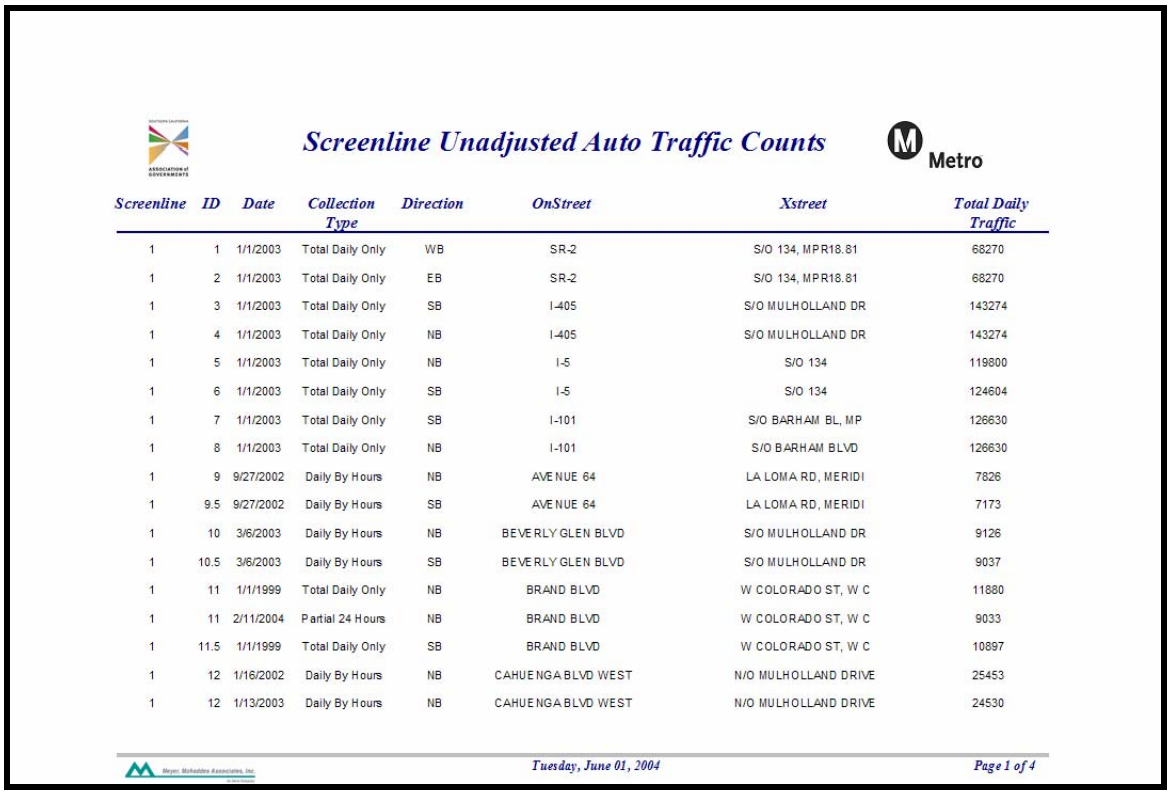


Figure 11. Daily Auto Traffic Count Report



Screenline Unadjusted Auto Traffic Counts

Metro

Screenline	ID	Date	Collection Type	Direction	OnStreet	Xstreet	Total Daily Traffic
1	1	1/1/2003	Total Daily Only	WB	SR-2	S/O 134, MPR18.81	68270
1	2	1/1/2003	Total Daily Only	EB	SR-2	S/O 134, MPR18.81	68270
1	3	1/1/2003	Total Daily Only	SB	I-405	S/O MULHOLLAND DR	143274
1	4	1/1/2003	Total Daily Only	NB	I-405	S/O MULHOLLAND DR	143274
1	5	1/1/2003	Total Daily Only	NB	I-5	S/O 134	119800
1	6	1/1/2003	Total Daily Only	SB	I-5	S/O 134	124604
1	7	1/1/2003	Total Daily Only	SB	I-101	S/O BARHAM BL, MP	126630
1	8	1/1/2003	Total Daily Only	NB	I-101	S/O BARHAM BLVD	126630
1	9	9/27/2002	Daily By Hours	NB	AVENUE 64	LA LOMA RD, MERIDI	7826
1	9.5	9/27/2002	Daily By Hours	SB	AVENUE 64	LA LOMA RD, MERIDI	7173
1	10	3/6/2003	Daily By Hours	NB	BEVERLY GLEN BLVD	S/O MULHOLLAND DR	9126
1	10.5	3/6/2003	Daily By Hours	SB	BEVERLY GLEN BLVD	S/O MULHOLLAND DR	9037
1	11	1/1/1999	Total Daily Only	NB	BRAND BLVD	W COLORADO ST, W C	11880
1	11	2/11/2004	Partial 24 Hours	NB	BRAND BLVD	W COLORADO ST, W C	9033
1	11.5	1/1/1999	Total Daily Only	SB	BRAND BLVD	W COLORADO ST, W C	10897
1	12	1/16/2002	Daily By Hours	NB	CAHUENGA BLVD WEST	N/O MULHOLLAND DRIVE	25453
1	12	1/13/2003	Daily By Hours	NB	CAHUENGA BLVD WEST	N/O MULHOLLAND DRIVE	24530

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3. ASSEMBLE EXISTING TRAFFIC DATA

The SCAG regional screenline system consists of eighteen screenlines which are comprised of a total of 810 traffic count locations on the freeways and arterials. It should be noted that each location refers to a single directional street segment, e.g., Sepulveda south of Mulholland Drive, *eastbound* direction. The number of count locations (points) on each screenline is presented in Table 2.

Table 2. Screenline Summary

Screenline	Number of locations
1	50
2	94
3	64
4	60
5	60
6	56
7	44
8	40
9	48
10	20
11	14
12	14
13	14
14	18
15	24
16	44
17	124
18	22
Total	810

To obtain the latest auto and truck traffic counts, as well as auto occupancy data, multiple agencies, counties and cities were contacted, as seen in Table 3. As was expected, most of the available traffic counts from existing data sources are strictly auto counts. Vehicle classification data as well as auto occupancy data collection are rarely conducted or cataloged on a routine or systematic basis.

For freeways, the major sources of the traffic counts are the SCAG Regional Transportation Monitoring Information System (RTMIS) and Caltrans Performance Measurement System (PeMS).

RTMIS is a transportation monitoring and performance assessment application, which allows the public and SCAG members to view, monitor and edit the transportation data over the Internet (http://rtmisweb.scag.ca.gov/rtmis/aspx/default.aspx). Transportation data is collected from different agencies such as Caltrans, county transportation commissions and local jurisdictions.

Table 3. Existing Traffic Data Resources

	Freeways	Arterials
Autos	• Regional Transportation Monitoring & Information System (RTMIS) • Caltrans Performance Monitoring System (PeMS) • MTA HOV Performance Study • Caltrans Annual traffic count report	• HPMS Data • Orange County Transportation Authority • Riverside County • San Bernardino County • Ventura County • Los Angeles County • City of Duarte Glendale Hawthorne Inglewood La Habra La Palma Long Beach Los Alamitos Los Angeles Lynwood Moreno Valley Ontario Orange Palm Springs Paramount Perris Pico Rivera Redlands Rialto Santa Ana Santa Clarita Simi Valley Upland Westlake Village
Trucks	• SCAG Regional Goods Movement Count Study	• SCAG Regional Goods Movement Count Study
Auto Occupancy	• Caltrans HOV Annual Reports ○ District 7 (2003) ○ District 8 (2000) ○ District 11(2003)	

PeMS is a freeway performance measurement system for all of California. It collects and stores data from loop detectors operated by the California Department of Transportation (Caltrans). Program applications convert these data into information accessible through the Internet (http://pems.eecs.berkeley.edu/) by Caltrans personnel, value-added resellers, the public, and the research community.

To collect freeway traffic counts from this system, a PeMS/RTMIS loop detector in the vicinity of each freeway screenline location was identified and the daily vehicle counts were obtained from RTMIS and PeMS. For the screenline

locations outside the coverage area of the RTMIS, the traffic counts were obtained from the Caltrans 2002 Annual Traffic report. A summary of the amount of available traffic data is presented in Table 4.

Table 4. Existing Traffic Counts by Functional Class

	Auto	Trucks
Freeways	108	76
Principal Arterials	175	65
Major Arterials	178	38
Major Collectors	30	2
HOVs	38	N/A
Total	529	181

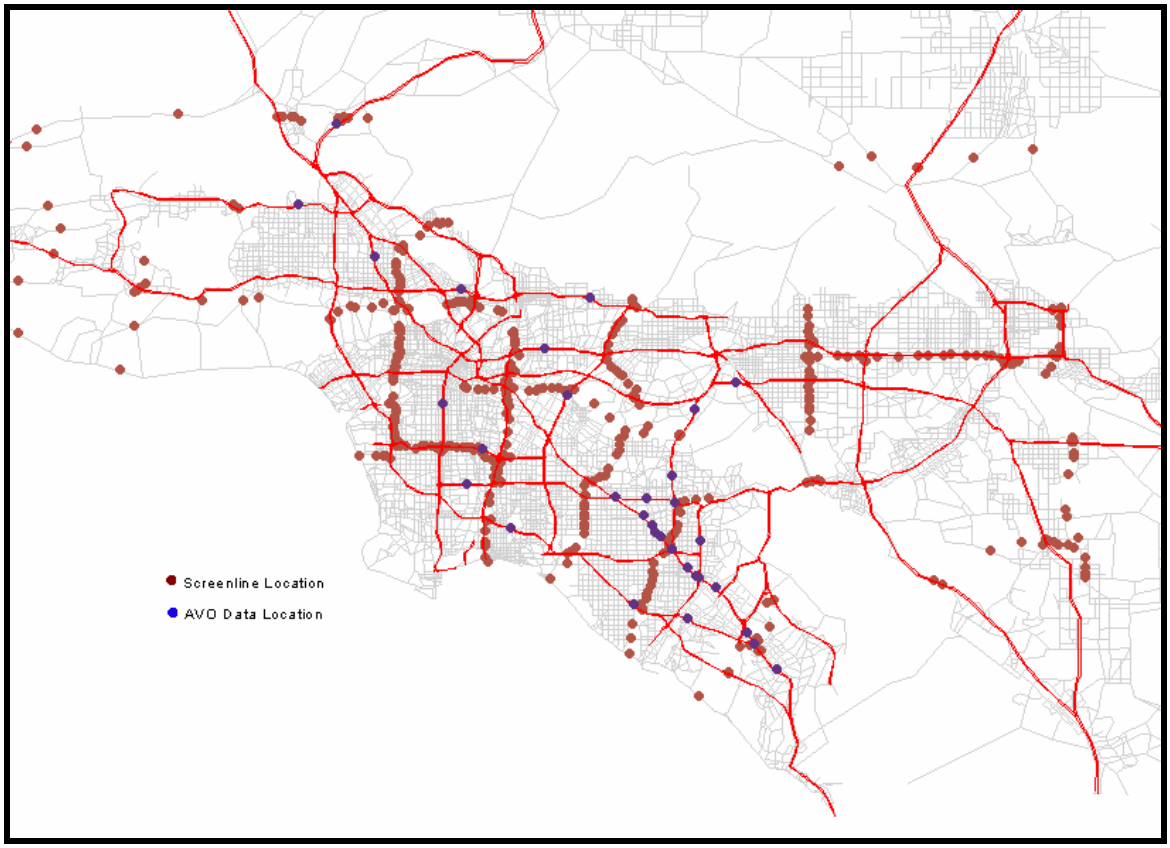
The arterial auto counts were collected by contacting the appropriate city or county and requesting the traffic count at the specific screenline location. In most cases, only single-day vehicle count data was available.

The major source of truck count data collection was the SCAG 2001 Regional Goods Movement Count Study. The purpose of the study was to develop a comprehensive truck count database to be used for validating the SCAG Heavy Duty Truck model. 24-hour truck classification counts were taken as part of the study.

Auto occupancy data collection is mainly performed by Caltrans district offices for limited locations along freeways as part of their HOV Annual reports. The report contains traffic performance data for mixed-flow lanes and HOV lanes including volumes and vehicle occupancies for the AM and PM peak periods. All locations where Caltrans had collected data were geocoded and overlaid with the screenline points as shown in Figure 12. Only a few auto occupancy count locations were in the vicinity of the screenline data points.

MTA's HOV Performance Study was also reviewed for this effort. The study included an extensive effort to collect and analyze traffic and user data to evaluate the effectiveness of the carpool lane system in Los Angeles County. However, the traffic data included in this study were not in the vicinity of screenline locations and therefore were not incorporated into the regional screenline database.

Figure 12. Auto Occupancy Count Locations



4. FRAMEWORK FOR TRAFFIC COUNT PROGRAM

Traffic volumes at a given location vary over a number of different time periods, including time of day, day of week and season (month) of the year. This variability must be measured and accounted for when using short duration traffic counts for the database. Short duration traffic counts are like "snapshots" that only measure the traffic conditions at the particular time when the counts are taken. To use these data to estimate "average" conditions, adjustments must be made to account for variability in the traffic stream.

The first step in development of traffic count adjustment factors is determining how the traffic count locations should be grouped together, defined as the functional class framework. Once the functional class framework is defined, adjustment factors can be developed for converting short duration one-day traffic counts to the Annual Average Weekday Traffic (AAWT) counts.

The main objective of the framework is to define a set of roads as a "group" whose members are assumed to behave similarly in terms of traffic volume characteristics. There are two issues to consider in grouping the roads. First, within-group variability should be minimized and second, between-group variability should be maximized. After careful review of the screenline count locations, they were grouped in a Three-Tier system framework as follows:

- Tier 1 – Freeways, HOVs, toll roads and state highways
- Tier 2 – Principal and minor arterials
- Tier 3 - Major collectors

To verify the framework structure, statistical analyses were performed to compare the average daily Light- and Medium-Duty Vehicles (L&MDV) and Heavy-Duty Vehicles (HDV) per lane across the tiers. The analyses was based on the SCAG 2000 screenline traffic count dataset which has the L&MDV and HDV counts for the original sixteen 2000 regional screenlines.

Though the new 2003 regional screenline system has eighteen screenlines, the 2000 screenline traffic count dataset with the sixteen screenlines is sufficient for the purpose of framework analyses. For the 2000 screenline dataset, the HDV counts were developed based on the Goods Movement Study for freeway locations and assumed that all arterial locations would have 3 percent trucks.

4.1 Light-Medium Duty (LMD) Vehicles

Based on the daily traffic volumes per lane, the descriptive statistics of the three-tier framework are generated and the results are presented in Table 5. As shown in Table 5, the mean daily Light-Medium Vehicle traffic volumes are 20,030,

5,400 and 1,975 vehicles per lane for the Tiers 1, 2 and 3, respectively. Results indicate that the three tiers truly exhibit different characteristics and substantial variability exists among the three tiers.

Table 5. Descriptive Analysis of Daily Light-Medium Vehicles Traffic Volumes Per Lane Based on Three-Tier Framework

SCAG Tier		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
1	Freeways, Toll Roads and HOVs	100	20,030	6,997	700	18,642	21,419	6,099	34,378
2	Principal & Minor Arterials	242	5,400	2,777	179	5,048	5,752	49	15,278
3	Major Collectors	25	1,975	1,329	266	1,427	2,525	68	4,890
Total		367	9,153	7,975	416	8,335	9,972	49	34,378

4.2 Heavy Duty Vehicles

Since truck traffic flow characteristics differ from the auto traffic, the reliability of using the Three-Tier system for Heavy Duty Vehicles (HDV) must be examined. To conduct a complete analysis, the HDV counts are required for a sufficient number of screenline locations on all Tiers, and the only available data set was SCAG's Goods Movement Truck Count Study. However, the truck data was collected only for freeways, state routes and major principals. Hence, the analysis in this report is very limited and further investigation of this subject is warranted.

Using the truck data collected as part of the Goods Movement Truck Count Study, descriptive statistics are performed for each tier and results are presented in Table 6. The mean daily traffic count for Tiers 1 and 2 are 1,890 and 603 vehicles per lane, respectively. A comparison of the means indicates that the two tiers are different and variability exists between the two tiers, however, there is no data available for Tier 3 locations.

Table 6. Descriptive Statistics For Heavy Duty Vehicle Traffic Volumes Based on Three-Tier Framework

Tier	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	75	1,890	1,052	121	1,648	2,132	80	4,822
2	102	603	846	84	437	770	50	7,237
3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	177	1,148	1,132	85	980	1,316	50	7,237

4.3 AAWT Adjustment Factors

It is necessary to develop adjustment factors for converting the daily short duration traffic counts to the Annual Average Weekday Traffic (AAWT) for each screenline location. Unfortunately, data needed to convert each short duration count into an AAWT with accuracy and precision requires continuously collecting the traffic volume counts for the entire year.

Since there are insufficient continuous counter locations that describe how traffic behaves at each location, especially at the arterial locations, the adjustment factors are developed from data collected at available continuously operated data collection sites. Then adjustment factors are applied to locations where continuous data is not available**.**

4.3.1 Tier 1 AAWT Adjustment Factors

For the freeways, a loop detector in the vicinity of each freeway screenline location was identified and the daily vehicle counts were obtained from RTMIS for January 1, 2003 through December 31, 2003. However, review of the RTMIS data indicated that traffic counts were missing for some months.

For the missing traffic count period, PeMS was used to obtain the traffic counts. If daily traffic counts were not available from PeMS for 2003, then the 2002 daily traffic counts were adjusted to 2003 by applying an annual growth factor and substituted for the 2003 daily traffic counts. The freeway annual growth factors were developed for the freeway segments within each county based on the 1999 and 2001 Caltrans count data as presented in Appendix A.

Next, the distribution of data for each location was examined in detail to identify the outlier data points. To eliminate the outliers from the data set and maintain consistency for all locations, only points within two standard deviations of the mean (approximately 95 percent of the measurements) are included in calculation of the average annual daily traffic.

Based on the above methodology, the AAWT factors by day of the week and month of the year were developed. The AAWT factor for a specific day of the week within a month is calculated by calculating the average of traffic counts for all days within that month and dividing that number by the average of weekday traffic counts for the entire year.

As a sample, the AAWT factors for I-405 Southbound south of Harbor Boulevard are provided in Table 7 and AAWT factors for freeway locations are provided in Appendix B. The AAWT factors for freeway locations with insufficient data or outside the RTMIS system are developed by assigning them to the nearest freeway location with similar characteristics and available AAWT adjustment factors.

Figure 13. RTMIS Loop Detector System

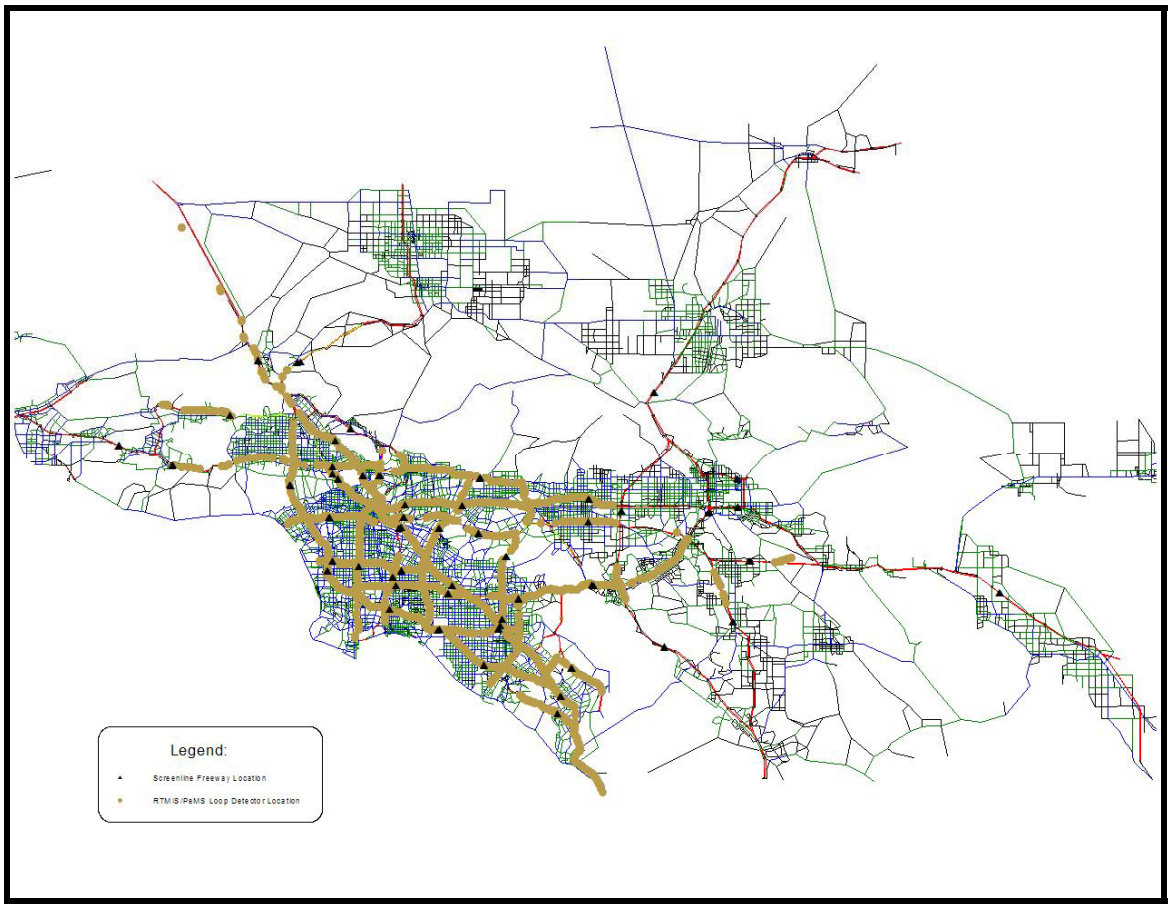


Table 7. 2003 AAWT Adjustment Factor
(I-405 SB W/O Harbor Blvd.)

	Mon	Tue	Wed	Thur	Fri
Jan	0.93 (4)	0.98 (3)	0.97 (4)	1.06 (5)	1.1 (5)
Feb	0.97 (3)	1 (4)	1.03 (4)	1 (4)	1.05 (4)
Mar	1 (2)	1.01 (4)	1.02 (4)	1.01 (5)	0.86 (4)
April	0.96 (4)	0.98 (4)	0.99 (4)	1 (4)	1.02 (5)
May	0.95 (4)	0.99 (5)	0.98 (4)	1 (4)	1.02 (4)
June	0.93 (4)	0.96 (4)	0.97 (5)	0.99 (5)	1.01 (5)
July	0.99 (4)	1.04 (4)	1.06 (4)	1 (4)	1.01 (4)
Aug	1.03 (5)	0.97 (5)	1.04 (5)	1.01 (4)	1.08 (4)
Sept	0.88 (3)	0.96 (3)	0.96 (4)	0.94 (4)	0.99 (4)
Oct	0.91 (4)	0.94 (4)	0.95 (4)	0.98 (4)	1 (4)
Nov	0.95 (3)	0.89 (4)	0.98 (4)	1.01 (3)	1.02 (4)
Dec	0.94 (4)	0.94 (5)	0.98 (5)	1 (4)	0.99 (4)

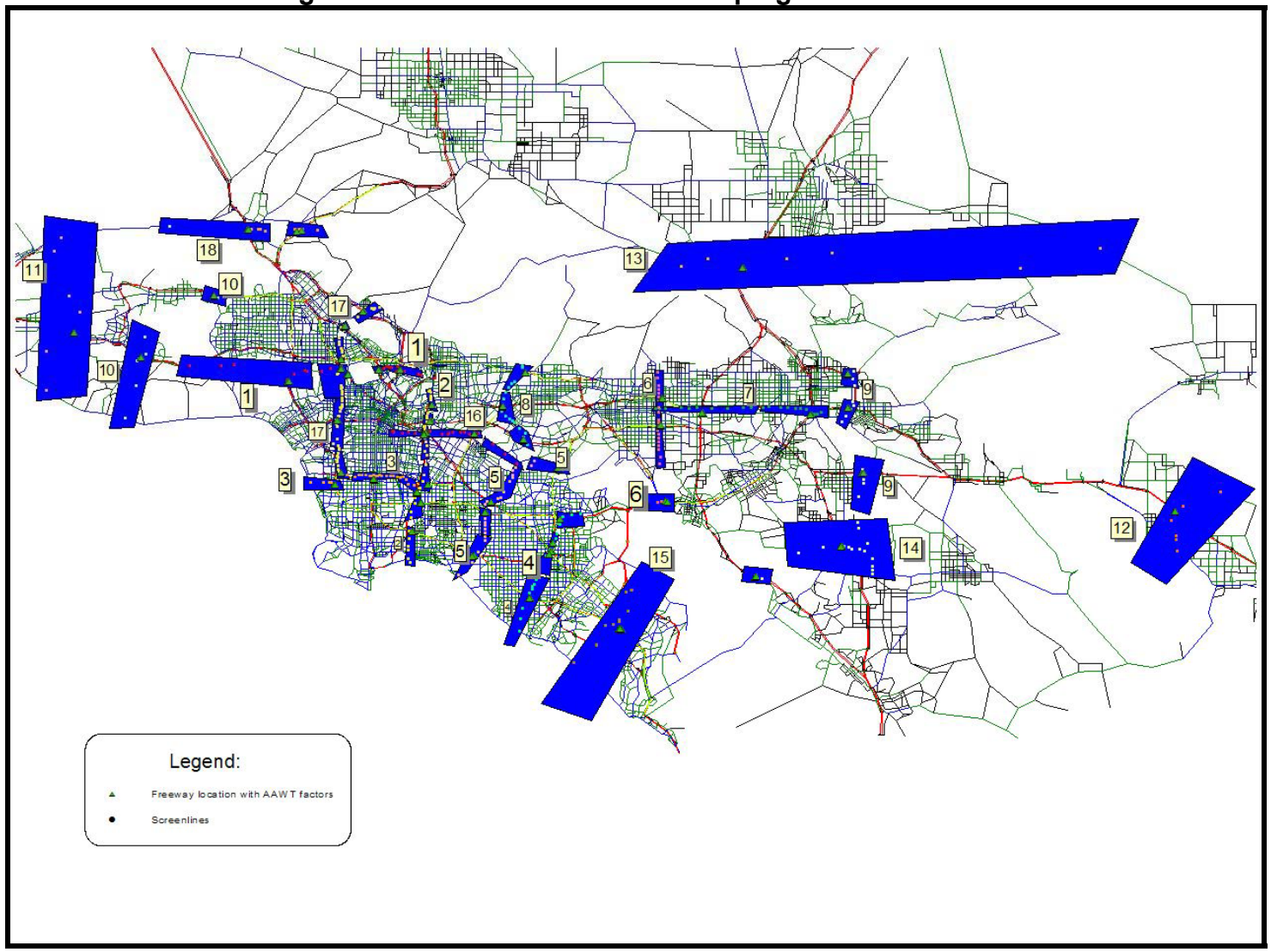
(x) Number of observations

4.3.2 Tiers 2 and 3 Adjustment Factors

Since continuous traffic count data is not currently available for Tiers 2 and 3 locations, the *Same Road Factor* method as described in the Highway Performance Monitoring System (HPMS) Traffic Monitoring Guide was used for converting the daily short traffic counts to AAWT counts. This process assigns the AAWT factor from single continuous count locations to all road segments within the influence area of that count site.

In this approach, the Tiers 2 and 3 locations are assembled into groups and each group is assigned to a specific Tier 1 location. Next, the adjustment factors from the assigned Tier 1 location are applied to the locations within the group. For the Tier 1 locations where the AAWT are not available, nearby locations with AAWT are substituted. Tiers 2 and 3 locations with their corresponding Tier 1 locations are presented in Figure 14. The detailed list of these groupings by screenline are included in Appendix C.

Figure 14. Same Road Factor Grouping for Screenlines



5. NEW FIELD TRAFFIC COUNT DATA COLLECTION

One of the major tasks of the study is to collect new traffic counts for the locations where current counts were not available. Review of available existing traffic counts as discussed in section 3 indicated that traffic counts are not available for 280 of the screenline locations. Based on the available budget and the Technical Review Committee recommendations, the first priority was given to collect auto counts for screenline locations without traffic counts in Los Angles County, and the remaining budget was allocated to conduct visual vehicle classification counts.

Based on the recommended approach, the consultant team developed a traffic data collection plan for conducting visual vehicle classification counts as well as 24-hour machine counts. The traffic count data collection was conducted by count company Wiltec.

The goal of the vehicle classification counts was to get a representative sample of truck percentages along Tiers 2 and 3 locations. Based on the remaining budget for this task, vehicle classification counts were collected for 55 locations from 6 AM to 7 PM which corresponds to the AM, Mid-day and PM peak periods of the SCAG regional model. The counts are classified by: 1) total vehicles, 2) trucks by axle (excluding pick-ups), and 3) buses.

The 55 new classification counts were divided among the three arterial roadway classifications and the seven area types. The three arterial roadway classifications are: principal arterials, major arterials and minor collectors. The seven area types are: Core, Central Business District (CBD), Urban Business District, Urban, Suburban, Rural and Mountain.

The following assumptions and guidelines were used in selecting individual locations to be counted:

- Each of the 667 one-way arterial segments that cross one of the SCAG model screenlines was considered to be an independent source of data on truck movements. Although each one-way segment is typically one direction of a two-way street, no attempt was made to organize the data on a street-by-street basis. Some streets were counted in both directions. Others were counted in one direction or not at all. This analysis assumes that the one-way segment counts will not be used to estimate truck movements in the opposite direction. Instead, the one-way segment counts will be averaged to determine average truck percentages by classification.

- It was considered desirable to obtain counts for approximately the same percentage of locations for each roadway classification.

- Within each roadway classification, it was considered desirable to collect a representative sample of locations in each area type.

- Based on the three conditions listed above, the locations were selected to provide a broad distribution among screenlines and geographical areas within the SCAG model area.

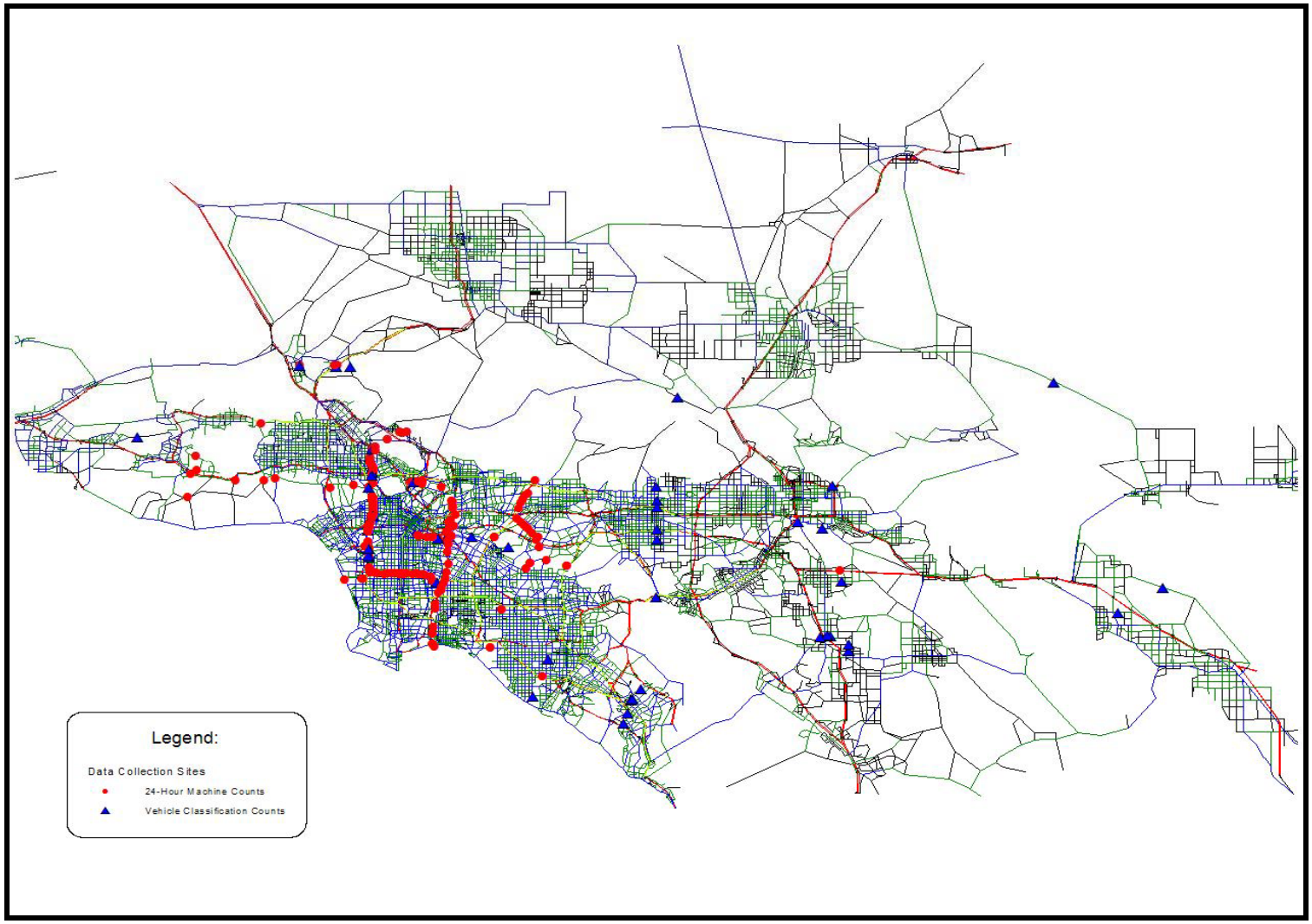
- No attempt was made to distribute the counts equally by County.

- Since there was some overlap between the visual vehicle classification counts and the 24-machine count locations, it was decided to conduct both counts simultaneously if possible.

For the 24-hour machine counts, the arterial locations without traffic counts along screenlines 1, 2, 3, 5, 8, 10, 16, 17 and 18 were counted for a 24-hour period on a Tuesday, Wednesday or Thursday during the months of February and March 2004. There were 242 locations counted along these screenlines as presented in Figure 15 and included in Appendix D.

Upon completion of this effort, the collected data was quality-controlled for accuracy and checked for anomalies and was then stored in the Regional Traffic Count Database System. The vehicle classification locations are presented in Figure 15 and are included in Appendix E.

Figure 15. Traffic Data Collection Sites



6. 2003 ANNUAL AVERAGE WEEKDAY TRAFFIC (AAWT) COUNTS

The existing traffic counts and the counts assembled from various sources as part of this study are from different years as well as different days and months of the year. Since the objective of this study is to develop the 2003 annual average weekday traffic (AAWT) counts, different adjustments need to be made to the counts. The adjustment factors are developed for each Tier of the functional class system, as described in section 4.

The primary sources of traffic counts for Tier 1 locations are RTMIS, PeMs and Caltrans 2002 annual traffic count book. For Tiers 2 and 3 locations, the traffic counts were collected from cities, regional and subregional governments, traffic counts collected as part of this study and the Highway Performance Monitoring System (HPMS) data.

6.1 Tier 1 AAWT Traffic Counts

As discussed in section 4 of the report, all available 2003 Tier 1 traffic counts are obtained from RTMIS by identifying a PeMS/RTMIS loop detector on the desired freeway section. For the days without traffic count data, the PeMS was used to obtain the 2003 daily traffic counts. Then, using the combined dataset from RTMIS and PeMS, the 2003 AAWT counts are calculated. Results are compared with the Caltrans 2002 AADT counts and presented in Appendix F.

It should be noted that even with the methodology outlined above, some locations do not have a complete daily traffic count data set for the entire year. For the freeway locations where data is not available from either RTMIS or PeMS, the Caltrans 2002 AADT count is used to estimate the 2003 AADT count by applying a freeway specific growth factor. The 2003 Tier 1 AAWT traffic counts are presented in Appendix G.

6.2 Tiers 2 and 3 2003 AAWT Counts

For most of the arterial streets, only one-day traffic counts are available. To use a one-day traffic count to estimate “average” 2003 conditions, adjustments must be made to account for variability in the traffic flow. The 2003 arterial AAWT counts are developed by applying adjustment factors as follows:

- AAWT adjustment
- Annual growth adjustment

The first adjustment factor, AAWT, is intended to convert the one-day traffic count to AAWT count. Since site specific daily traffic counts are not available for the entire year, the same road methodology is used to develop the AAWT counts

as discussed in section 4. Depending on when the count was collected (day of the week and month), an AAWT factor is applied to the count.

The second adjustment factor is used to convert the historical or the 2004 traffic counts to 2003 traffic conditions. The annual percent growth factors are developed by comparing the traffic counts in the same location over a two-year period for each county.

It should be noted that since such data was not available for the screenline locations, except in Orange County, data from other sites are used to develop the annual growth factors. The results are presented in Table 8 and the complete data set is provided in Appendix H. The AAWT and annual growth adjustment factors for each location is provided in Appendix G.

Table 8. Annual Arterial Traffic Growth

Orange						
Year	N	Minimum	Maximum	Sum	Mean	Std. Deviation
1999	50	6,000	56,805	1,375,248	27,504	11,414
2001	50	5,716	50,000	1,428,060	28,561	10,949
Average Annual Percent Change				*1.9*		
Riverside						
Year	N	Minimum	Maximum	Sum	Mean	Std. Deviation
1999	243	2,215	39,255	1,974,305	8,124	5,928
2001	243	2,024	37,855	2,163,053	8,901	6,209
Average Annual Percent Change				*4.7*		
Ventura						
Year	N	Minimum	Maximum	Sum	Mean	Std. Deviation
2000	87	300	36,500	645,400	7,418	7,335
2002	87	400	40,400	680,300	7,819	7,661
Average Annual Percent Change				*2.7*		
Los Angeles						
Year	N	Minimum	Maximum	Sum	Mean	Std. Deviation
2000	31	920	61,322	668,196	23,041	16,544
2001	31	938	62,976	697,357	24,046	16,506
Average Annual Percent Change				*2.2*		
San Bernardino						
Year	N	Minimum	Maximum	Sum	Mean	Std. Deviation
1999	22	59	13,266	37,437	1,701	2,882
2001	22	50	14,209	39,375	1,794	2,966
Average Annual Percent Change				*2.6*		

7. HEAVY DUTY VEHICLE (HDV) PERCENTAGE OF TRAFFIC FLOW

Once the 2003 AAWT counts are developed, the HDV percentage for each location is estimated. The Tier 1 truck percentages are developed from the data collected as part of the Goods Movement Study and Caltrans 2002 annual truck count report. For Tiers 2 and 3 locations, the vehicle classification counts collected as part of this study are used to develop truck percentages.

7.1 Tier 1 HDV Percentages

As part of the Goods Movement Study, vehicle classification counts were collected along the screenline freeway locations, however, the light-medium duty vehicles (autos) were not counted. Hence, the date specific total vehicle count is estimated by obtaining the 2003 total vehicle counts from PeMS and reducing the count to reflect the 2000 traffic count by applying the freeway annual growth factors described above. Next, the truck percentages are calculated for each location and results are presented in Appendix I.

To verify the results, truck percentages are estimated by route and county and compared with the truck percentages estimated based on the Caltrans 2002 truck count data. Results are presented in Table 9. As shown in Table 9, the results are relatively consistent between the two data sets.

For the freeway locations where truck counts were not available, the truck percentages are developed based on the Caltrans 2002 truck count report. The Tier 1 HDV percentages for each location are provided in Appendix G.

Table 9. Tier 1 Truck Percentages

Freeway/ State Route	County	Goods Movement Study	Caltrans 2002 Truck Counts
SR-2	Los Angeles	2.0%	3.0%
I-5	Los Angeles	9.0%	9.0%
I-5	Orange	7.0%	7.0%
I-10	Los Angeles	6.0%	5.0%
I-10	San Bernardino	10.0%	10.0%
SR-22	Orange	6.0%	5.0%
SR-57	Orange	7.0%	8.0%
SR-60	Los Angeles	12.0%	8.0%
SR-60	Riverside	16.0%	13.0%
SR-91	Los Angeles	10.0%	6.0%
SR-91	Orange	7.0%	7.0%
SR-91	Riverside	9.0%	6.0%
US101	Los Angeles	4.0%	3.0%
I-105	Los Angeles	7.0%	9.0%
I-110	Los Angeles	7.0%	4.0%
SR-118	Ventura	5.0%	6.0%
I-210	Los Angeles	11.0%	6.0%
I-405	Los Angeles	5.0%	5.0%
I-405	Orange	5.0%	6.0%
I-710	Los Angeles	17.0%	12.0%

7.2 Tiers 2 and 3 HDV Percentages

The arterial truck percentages for each functional class are developed based on the vehicle classification counts collected as part of this study. Total autos and trucks are aggregated by functional class and the percent trucks are estimated as shown in Table 10 with the complete data set provided in Appendix J. The Tiers 2 and 3 HDV percentages for each location are provided in Appendix G.

Table 10. Tiers 2 and 3 HDV Percentages

Functional Class	Auto	Trucks	Truck%
Major Principal	80,084	2,628	3.2%
Minor Principal	183,953	4,243	2.3%
Major Collectors	27,556	828	2.9%

8. MAINTENANCE AND UPDATE

The SCAG regional model is updated and validated on a three-year cycle and new traffic counts are needed for this effort. Since collecting traffic data for model validations just prior to a model validation effort is a major task, it is recommended that traffic data collection be conducted on a regular yearly schedule. Such an approach reduces the burden of cost and effort as well as allows for continuous traffic monitoring.

To implement a successful continuous traffic monitoring program, a plan including goals, objectives and action items is required. The plan should be a cost effective process to keep the regional screenline traffic count program up-to-date and generate valuable and useful information for all parties involved. After assessing what has been learned during the course of this project, a set of objectives and actions are proposed as follows:

GOAL: The regional screenline traffic count program shall improve the quality of the traffic data that supports the regional model as well as sub-regional models validation efforts through up-to-date traffic data and consistent traffic monitoring standards.

Objective: Create A Cooperative Traffic Monitoring Program

Action Item*:* SCAG should lead the effort to create a Cooperative Traffic Monitoring Program committee, including but not limited to California Department of Transportation (Caltrans), Los Angles County Metropolitan Transportation Authority (LACMTA), Orange County Transportation Authority (OCTA), Riverside County Transportation Commission (RCTC) and San Bernardino Associated Governments (SANBAG). The committee shall meet on a regular basis to coordinate the data collection needs, ensure consistency in data collection and secure funding for the program.

Cooperative traffic monitoring by all interested parties provides the possibility to satisfy data needs for both the regional model and sub-regional modeling efforts. It is recommended that dialogue be established to assure quality in data standard as well as the traffic data formats and summary statistics.

By coordinating traffic monitoring efforts between interested parties, more data will be available to users at relatively little increase in cost; duplication in the collection of traffic counts will be reduced or eliminated and resources can be more efficiently distributed to take advantage of each agency's capabilities and interests.

Objective: Ensure Consistency of RTMIS with PeMS (Tier 1)

Action Item: RTMIS, which was implemented by SCAG in 2003, is an extremely valuable tool for the collection of continuous traffic volumes on most of the Tier 1 locations. During the course of this project, some inconsistencies or lack of data were observed in comparison with the PeMS.

RTMIS needs to be coordinated more closely with the Caltrans Performance Measurement System (PeMS) methodologies, assumptions and updated loop detector locations. Working with PeMS should address the need for inclusion of more screenline locations in the system.

Objective: Collect Light & Medium Duty Vehicle (LMV) Counts – Tiers 2 and 3 Locations

Action Item: 24-hour machine counts should be collected on a three-year cycle for each screenline location. The three-year cycle is based on American Association of State Highway and Transportation Officials (AASHTO) recommendations. The cost of this effort can be minimized through coordination with all interested parties. Data collected can also be used to develop the annual growth factors to be applied to the data set if needed.

New technologies such as the Automated Traffic Surveillance and Control (ATSAC) system should be explored to collect continuous traffic counts for Tier 2 locations. Coordination with SCAG's Intelligent Transportation Systems (ITS) group could identify the cities with such capabilities for collecting and archiving continuous traffic data. Such data will be used to develop Tiers 2 and 3 AAWT adjustment factors rather than using Tier 1 AAWT adjustment factors.

Objective: Collect Heavy Duty Vehicle (HDV) Counts

Action Item: Vehicle classification counts should be collected at least every three years at Tiers 1 and 2 locations. With further study and analysis of HDV traffic on Tier 3 locations, only a sample of locations may be required to conduct vehicle classification counts. It should be noted that auto counts need to be collected at the same time in order to correctly estimate the HDV percentages.

Objective: Collect Auto Vehicle Occupancy (AVO) Data

Action Item: Coordinate with Caltrans district offices as they collect Auto Vehicle Occupancy (AVO) data on a regular basis for their High Occupancy Vehicle (HOV) Annual report. The AVO data is not collected at the SCAG screenline locations. Coordination with Caltrans may resolve this issue.

APPENDIX A – FREEWAY ANNUAL GROWTH FACTORS

APPENDIX B – TIER 1 AAWT ADJUSTMENT FACTORS

APPENDIX C – TIERS 2 & 3 ADJUSTMENT FACTORS

APPENDIX D – 24-HOUR MACHINE COUNT LOCATIONS

APPENDIX E – VEHICLE CLASSIFICATION COUNT LOCATIONS

APPENDIX F – COMPARISON OF CALTRANS 2002 FREEWAY COUNTS WITH 2003 AAWT

APPENDIX G – 2003 AAWT COUNTS

APPENDIX H – ANNUAL ARTERIAL GROWTH FACTORS

APPENDIX I – TIER 1 TRUCK PERCENTAGES

APPENDIX J – TIERS 2 & 3 TRUCK PERCENTAGES